MATERIAL SAFETY DATA SHEET

1. SUBSTANCE AND SOURCE IDENTIFICATION

National Institute of Standards and Technology
Standard Reference Materials Program
100 Bureau Drive, Stop 2320
Gaithersburg, Maryland 20899-2320

SRM Number: 1693a
MSDS Number: 1693a
SRM Name: Sulfur Dioxide in Nitrogen

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Description: This SRM mixture of sulfur dioxide in nitrogen is supplied in a DOT 3AL specification aluminum (6061 alloy) cylinder with a water volume of 6 L. Mixtures are shipped with a nominal pressure exceeding 12.4 MPa (1800 psi), which provides the user with 0.73 m^3 (25.8 ft^3) of useable mixture. The cylinder is the property of the purchaser and is equipped with a CGA-660 stainless steel valve, which is the recommended outlet for this sulfur dioxide mixture. NIST recommends that this cylinder **NOT** be used below 0.7 MPa (100 psi).

Substance: Sulfur Dioxide/Nitrogen Compressed Gas Mixture.

Other Designations: **Sulfur Dioxide** (sulfurous acid anhydride; sulfurous oxide; sulphur dioxide; sulfurous anhydride; fermenticide liquid; sulfur oxide)/**Nitrogen** (dinitrogen) compressed gas mixture.

2. COMPOSITION AND INFORMATION ON HAZARDOUS INGREDIENTS

Component	CAS Registry	EC Number (EINECS)	Concentration
Sulfur Dioxide	7446-09-5	231-195-2	50 µmol/mol *
Nitrogen	7727-37-9	231-783-9	balance

* Concentration applies to the identified NIST cylinder.

Index, R/S Phrases (EU): Refer to Section 15, "Regulatory Information".

3. HAZARDS IDENTIFICATION

NFPA Ratings (Scale 0–4): Health = 3 Fire = 0 Reactivity = 0

Major Health Hazards: Respiratory tract burns, skin burns, eye burns, allergic reactions, difficulty in breathing, suffocation.

Physical Hazards: Cylinder may rupture or explode if exposed to heat.

Potential Health Effects (Short Term Exposure)

Inhalation: Respiratory tract burns, skin burns, eye burns, allergic reactions nausea, vomiting, difficulty breathing, headache, drowsiness, dizziness, tingling sensation, loss of coordination, convulsions, coma.

Skin Contact: Irritation, burns.

Eye Contact: Irritation, burns.

Ingestion: Ingestion of a gas is unlikely.

Listed as a Carcinogen/Potential Carcinogen

	Yes	No
In the National Toxicology Program (NTP) Report on Carcinogens		X
In the International Agency for Research on Cancer (IARC) Monographs		X
By the Occupational Safety and Health Administration (OSHA)		X

4. FIRST AID MEASURES

Inhalation: If adverse effects occur, remove to uncontaminated area. If not breathing, give artificial respiration by qualified personnel. Get immediate medical attention. **Note to Physician:** For inhalation, consider oxygen.

Skin Contact: Wash affected skin with soap and water for at least 15 minutes while removing contaminated clothing. Get medical attention, if needed.

Eye Contact: Immediately flush eyes, including under the eyelids, with copious amounts of water for at least 15 minutes. Get immediate medical attention.

Ingestion: Ingestion of gas is unlikely.

5. FIRE FIGHTING MEASURES

Fire and Explosion Hazards: Negligible fire hazard applicable to the identified NIST cylinder. Cylinder may rupture or explode if exposed to heat. Escaping gas mixture promotes combustion of surrounding materials.

Extinguishing Media: Regular dry chemical, carbon dioxide.

Fire Fighting: Move cylinder from fire area if it can be done without risk. Avoid inhalation of material or combustion by-products. Wear full protective clothing and NIOSH-approved self-contained breathing apparatus (SCBA).

Flash Point (°C): Not Applicable **Autoignition (°C):** Not Applicable **Method:** Not Applicable

Flammability Limits in Air (Volume %): Upper: Not Applicable

Lower: Not Applicable

Flammability Class (OSHA): Not applicable to the identified cylinder.

6. ACCIDENTAL RELEASE MEASURES

Occupational Release: Stop leak if possible without personal risk. Isolate hazard area and deny entry. Stay upwind and keep out of low areas. Refer to Section 13, "Disposal Considerations".

7. HANDLING AND STORAGE

Storage: Store and handle in accordance with all current regulations and standards. Secure cylinder to prevent physical damage. Keep valve protective cap on cylinder when not in use. Keep separated from incompatible substances. Store in a well-ventilated area. Subject to storage regulations: U.S. OSHA 29 CFR 1910.101.

Safe Handling Precautions: Wear safety goggles. See Section 8, "Exposure Controls and Personal Protection".

8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

Nitrogen Gas

ACGIH (inhalation): simple asphyxiant

UK OES (inhalation): simple asphyxiant

Sulfur Dioxide

OSHA TWA (inhalation): 13 mg/m^3 (2 ppm)

ACGIH TWA (inhalation): 13 mg/m^3 (2 ppm)

UK OES TWA (inhalation): Chemical Hazard Alert Notice Issued. (OES has been withdrawn)

Ventilation: Provide local exhaust or process enclosure ventilation system. Ensure compliance with applicable exposure limits.

Respirator: If necessary, refer to the "NIOSH Guide to the Selection and Use of Particulate Respirators Certified under 42 CFR 84" for selection and use of respirators with organic vapor cartridges certified by NIOSH.

Eye Protection: Wear safety goggles. **DO NOT** wear contact lenses in the laboratory. An eye wash station should be readily available near of handling and use areas.

Personal Protection: Wear protective clothing and chemically resistant gloves to prevent skin exposure.

9. PHYSICAL AND CHEMICAL PROPERTIES

Nitrogen Gas	Sulfur Dioxide Gas
Appearance and Odor: colorless and odorless	**Appearance, Odor, Taste:** colorless, irritating odor
Relative Molecular Mass: 28.01	**Relative Molecular Mass:** 64.06
Molecular Formula: N_2	**Molecular Formula:** SO_2
Boiling Point (°C): –196	**Boiling Point (°C):** –10
Freezing Point (°C): –210	**Freezing Point (°C):** –73
Vapor Density (air = 1): 0.97	**Vapor Density (air = 1):** 2.26
Volatility (%): 100	**Volatility (%):** not applicable
Solubility in Water: slightly soluble	**Solubility in Water (%):** 22 @ 0 °C
Solvent Solubility: soluble in liquid ammonia; slightly soluble in alcohol	**Solvent Solubility:** soluble in alcohol, acetic acid, ether, sulfuric acid, chloroform, acetone, aromatic carbides, benzene, liquid camphor, nitrobenzenes, sulfuryl chloride, toluene

10. STABILITY AND REACTIVITY

Stability: X Stable _____ Unstable

Stable at normal temperatures and pressure.

Conditions to Avoid: Avoid heat, flames, sparks and other sources of ignition. Minimize contact with material. Avoid inhalation of material or combustion by-products. Protect from physical damage. Cylinder may rupture or explode if exposed to heat.

Incompatibilities: Metals, oxidizing materials, combustible materials, bases, oxidizing materials, halogens, metal carbide, metal oxides, peroxides, reducing agents halogens, lithium.

Fire/Explosion Information: Refer to Section 5, "Fire Fighting Measures".

Hazardous Decomposition: Thermal decomposition or combustion produces oxides of nitrogen and sulfur.

Hazardous Polymerization: _____ Will Occur X Will Not Occur

11. TOXICOLOGICAL INFORMATION

Route of Entry: X Inhalation _____ Skin _____ Ingestion

Nitrogen Gas

Compressed nitrogen gas is a simple asphyxiant.

Sulfur Dioxide

LC_{Lo} (inhalation-human): 100 ppm/10 min

LC_{Lo} (inhalation-human): 3 ppm/5 day(s)

TC_{Lo} (inhalation-human): 12 ppm/1 h

LC_{Lo} (inhalation-human): 3000 ppm/5 min

TC_{Lo} (inhalation-human): 2.2 mg/m^3/30 min

TC_{Lo} (inhalation-human): 2.9 mg/m^3/10 min

Health Effects (Acute Exposure):

Inhalation of sulfur dioxide concentrations of 1–8 ppm have caused increased pulse rate, and a shallower, more rapid respiratory rate. Higher levels may cause intense irritation of the mucous membranes, severe choking, violent cough, hoarseness, sneezing, cessation of ciliary beat, rhinorrhea, chest pain or tightness, reflex bronchoconstriction, dyspnea, cyanosis, nausea, vomiting, abdominal pain, urinary incontinence, anxiety, mental confusion and unconsciousness. In severe exposures symptoms, possibly delayed, may include laryngeal and glottal edema, chemical pneumonitis or bronchopneumonia with bronchiolitis obliterans and rales. Death may be due to respiratory paralysis, pulmonary edema or systemic acidosis. Convulsions may occur terminally. The effects on pulmonary function are increased in the presence of respirable particles and some individuals are more sensitive than others.

The symptoms of asphyxia depend on the rapidity with which the oxygen deficiency develops and how long it continues. In sudden acute asphyxia, unconsciousness may be immediate. With slow development, there may be rapid respiration and pulse, air hunger, dizziness, reduced awareness, tightness in the head, tingling sensations, incoordination, faulty judgment, emotional instability, and rapid fatigue. As the asphyxia progresses, nausea, vomiting, collapse, unconsciousness, convulsions, deep coma and death are possible.

Target Organs: Inhalation of sulfur dioxide affects the immune system.

Medical Conditions Generally Aggravated by Exposure: Respiratory disorders.

12. ECOLOGICAL INFORMATION

Environmental Summary:

Nitrogen: No data available.

Sulfur Dioxide (fish toxicity): 3 mg/L/40 min.

13. DISPOSAL CONSIDERATIONS

Waste Disposal: Dispose in accordance with all applicable federal, state, and local regulations.

14. TRANSPORTATION INFORMATION

U.S. DOT and IATA: Compressed Gas, N.O.S. (Sulfur Dioxide in Nitrogen); UN1956; Hazard Class 2.2.
Canadian WHMIS: Compressed Gas, N.O.S. (Sulfur Dioxide in Nitrogen); UN1956; Hazard Class 2.2.

15. REGULATORY INFORMATION

U.S. REGULATIONS

CERCLA Sections 102a/103 (40 CFR 302.4): Not regulated.

SARA Title III Section 302 (40 CFR 355.30): Not regulated.

SARA Title III Section 304 (40 CFR 355.40): Not regulated.

SARA Title III Section 313 (40 CFR 372.65): Not regulated.

OSHA Process Safety (29 CFR 1910.119): Not regulated.

SARA Title III Sections 311/312 Hazardous Categories (40 CFR 370.21)

ACUTE:	Yes
CHRONIC:	No
FIRE:	No
REACTIVE:	No
SUDDEN RELEASE:	Yes

STATE REGULATIONS

California Proposition 65: Not regulated.

CANADIAN REGULATIONS

WHMIS Classification: Not determined.

EUROPEAN REGULATIONS

EU Classification

Nitrogen: Not determined.

Sulfur Dioxide:

T Toxic.

EU Risk and Safety Phrases

Nitrogen: Not determined.

Sulfur Dioxide:

R23	Toxic by inhalation.
R34	Causes burns.
S1/2	Keep locked-up and out of reach of children.
S9	Keep container in a well-ventilated place.
S26	In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S36/37/39	Wear suitable protective clothing, gloves and eye/face protection.
S45	In case of accident or if you feel unwell, seek medical advice immediately (show label where possible)

NATIONAL INVENTORY STATUS

U.S. Inventory (TSCA): Listed on inventory.

TSCA 12(b), Export Notification: Not listed.

16. OTHER INFORMATION

Sources: MDL Information Systems, Inc., MSDS *Nitrogen*, 16 June 2005.
MDL Information Systems, Inc., MSDS *Sulfur Dioxide*, 16 June 2005.